

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP2003/014013

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

**Description, Pages**

1-15 as originally filed

**Claims, Numbers**

1-10 received on 19.10.2005 with letter of 19.10.2005

**Drawings, Sheets**

1/10-10/10 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.
4. The amendments have resulted in the cancellation of:
- ☐ the description, pages:
- ☐ the claims, Nos.: 11,12
- ☐ the drawings, sheets:

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EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP2003/014013

Reference is made to the following documents:

- D1: EP-A-0 342 889 (HOLSET ENGINEERING CO) 23 November 1989
- D2: EP-A-1 260 675 (IVECO MOTORENFORSCHUNG AG) 27 November 2002
- D3: GB 874 085 A (GARRETT CORP) 2 August 1961
- D4: DE 10 34 192 B (BERNARD COLLIGNON;SNCF) 17 July 1958
- D5: US-A-4 056 330 (LIEBER JEAN) 1 November 1977
- D6: DE 102 10 369 A (DAIMLER CHRYSLER AG) 25 September 2003
- D7: DE 199 24 228 A (3K WARNER TURBOSYST. GMBH) 7 December 2000
- D8: US-A-4 586 336 (HOERLER HANSULRICH) 6 May 1986
- D9: US-A-6 158 956 (ARNOLD STEVEN DON) 12 December 2000
- D10: US-B1-6 216 459 (DAUDEL HELMUT ET AL) 17 April 2001
- D11: DE 198 35 594 A (AUDI NSU AUTO UNION AG) 10 February 2000
- D12: WO 2004/035994 A (HETTINGER; LOMBARD; LAVEZ) 29 April 2004

1. The application does not meet the requirements of Article 6 PCT for the following reasons:

- independent apparatus claims 1 and 9 lack conciseness
- independent claim 9 does not contain the same essential features as claim 1 thereby also conflicting with Rule 13.1 PCT
- the characterising portion of independent apparatus claim 9 is characterised by methodical features/steps
- independent method claim 8 is not restricted by the apparatus features "with turbochargers according to claim 6", hence does not contain all required essential features, see also point 5.
- independent claim 9 does not define in the characterising portion which engine ("an engine") is meant and how "the engine boosting system opens said annular nozzle" (Article 5 PCT)
- the characterising portion of claim 1 does not contain the same consistent feature formulation as its preamble: "into the radial inside or onto the radial outside"
- claims 1 to 4 refer to different subject-matter "nozzle device" and "variable nozzle device"
- claim 10 is not correctly made dependent on claim 6 or 9

As regards the feature "annular arrangement of vanes" it is obvious that all above mentioned documents D1 (Fig. 8), D2 (paragraph 0011), D3 (Fig. 3) and D4 (Fig. 1) (as well as D5, D8, D9, D11 and D12) contain such an arrangement. This feature, however, does not define where the vanes are fixed to.

- 2.2** Documents D7 (Fig. 3a, 3b) and D12 (Fig. 4a, 4b) both disclose an engine boosting system with a nozzle bypass opening according to **claim 9**. Although no catalysts or any other downstream consumer units are mentioned therein, both D7 and D12 systems are suitable beyond doubt for to be used in connection with such a catalyst, as e.g. shown in document D11.
- 2.3** Document D11 discloses all features of the method **claim 8** (even considering the parallel configuration of engine boosting turbochargers 2a, 2b), wherein the variable nozzle device (col. 4, lines 6-15) of the second turbocharger turbine (5b) completely closes its nozzle opening when said second turbocharger is driven under low rotational speed of the engine.

Please note, that the turbocharger systems of the internal combustion engines of documents D1, D2, D4, D7-D9 and D12, which are designed for completely closing their nozzle openings under low load/speed conditions, are also suitable for to be operated in a parallel boosting configuration.

- 3.** Dependent **claims 2-7** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(3)), as their additional features are disclosed in documents D1-D12 and used therein for the same technical purposes:

**Claim 2:** see D1, D2, D3 or D4

**Claim 3:** see D1 (Fig. 4) or D2 (Fig. 2) or D12 (Fig. 4a).

**Claim 4:** see D2-D5 or D8 (Fig. 3) or D12.

**Claim 5:** see e.g. D1, D2, D3 or D4

**Claim 6:** see e.g. D1-D4 (suitable for) or D10, D11

**Claim 7:** see D6 (whole doc) or D7 (completely closing of nozzle outlet 8b) or D10 (whole doc) or D12 (implicitly enclosed) or documents D1, D2, D4, D9 which are all suitable "for engine braking" purposes from their technical working

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principle point of view "... where there is provided a high boost pressure and a high back pressure at the same time"

4. So far, no clear, concise and novel set of independent apparatus and method claims have been filed. Furthermore, almost all cited prior art turbochargers which are equipped with a variable geometry, sliding vane technology fulfill the same technical principle, namely the control or regulation of the system pressures (boost, back) dependent on the load, flow or speed characteristic of their respective internal combustion engines and therefore can easily be applied in an engine boosting system with one or several turbochargers and be used for controlling, boosting, braking or for any other function typically known in the field of turbochargers. A sole aggregation of features as formulated in claims 1 to 4 can also not be considered as being sufficient to render the present application inventive over a combination of documents taken from e.g. D1-D4.
5. However, if it is the object of the present invention to apply the variable nozzle device of claim 1 to an engine boosting system with a catalyst for improving its purifying function at the start of the engine as expressed on page 4 of the description, the combination of features of **claims 9+10 (claims 9+1)** would appear to be new and inventive over the available prior art, provided that this object of invention can clearly be recognized in such a new claim, explicitly or implicitly.

All criteria of Articles 6 and 33(1) PCT would be met if such an engine boosting system and/or engine operating method, based on respective definite apparatus and method features according to the content of **claims 9+1**, would clearly be characterized and distinguished by the essential features representing this object of the invention; such as

- stepped portion for bypassing the turbine wheel
- at the start of the engine the annular nozzle is opened (full open position) such that the exhaust gas flow substantially bypasses the turbine wheel and quickly heats up the catalyst (or for quickly reaching the optimum catalyst purifying temperature).

Above combination of features is neither disclosed nor suggested by the available prior art nor can it be derived from for example a joint consideration of D1 or D2 with D11.

19-10-2005

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EP0314013

AP3 Rec'd PCT/PTO 08 JUN 2006

Enclosure of October 19, 2005

PCT-Application No.: PCT/EP03/014013  
Applicant: HONEYWELL INTERNATIONAL INC.  
Our ref.: WO 39135

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**Claims 1 to 10**

1. A nozzle device for a turbine of a turbocharger,  
10 comprising a variable annular nozzle (2) defined between an  
inboard wall (3) and an outboard wall (4), wherein

said outboard wall (4) is axially movable for  
completely closing said variable annular nozzle (2);

15 an annular arrangement of vanes (5) is interposed in  
said variable annular nozzle (2), and

said outboard wall (4) is constituted by a tube-shaped  
piston (6, 106) which is axially slidable into the radial  
inside or onto the radial outside of said annular  
arrangement of vanes (5) so as to contact said inboard wall  
20 (3),

**characterised in that**

said tube-shaped piston (6; 106) comprises at its  
distal end a stepped portion (17; 117) which is axially  
slidable onto the radial outside or radial inside of said  
25 annular arrangement of vanes (5).

2. The variable nozzle device according to claim 1,

wherein said stepped portion (117) is axially slidable  
onto the radial outside of said annular arrangement of  
30 vanes (5) and directs exhaust gas entering into the turbine  
to the downstream side of the turbine.

3. The variable nozzle device according to claim 1 or 2,  
wherein said annular arrangement of vanes (5) extends only  
35 over a part of the maximum interval between said inboard  
and outboard walls (3, 4).

4. The variable nozzle device according to any one of claims 1 to 3, wherein said inboard wall (3) is constituted by a vaned shroud (7) having said annular arrangement of  
5 vanes (5).

5. A turbocharger (8) having a turbine (1) comprising the variable nozzle device according to any one of claims 1 to  
4.

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6. An engine boosting system comprising a parallel configuration of at least a first and a second turbocharger (9, 8), wherein a turbine (1) of said second turbocharger (8) is characterized by a variable nozzle device according  
15 to any one of claims 1 to 4.

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7. Diesel engine boosting system comprising a turbocharger having a turbine (1) comprising the variable nozzle device according to any one of claims 1 to 4 and control means for  
closing the turbine annular nozzle (2) to an optimum  
position for engine braking where there is provided a high  
boost pressure and a high back pressure at the same time.

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8. A method for operating an internal combustion engine with a parallel configuration of turbochargers (9, 8) according to claim 6, wherein the variable nozzle device of the second turbocharger (8) completely closes its nozzle opening when said second turbocharger (8) is driven under  
low rotational speed of the engine.

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9. An engine boosting system comprising a turbocharger (8) and a catalyst (40) disposed downstream of said turbocharger (8), wherein the turbocharger (8) comprises an exhaust gas driven turbine (1) having a turbine wheel (13)  
35 and an annular nozzle (2),

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characterized in that

said engine boosting system opens said annular nozzle (2) at a start of an engine such that the exhaust gas flow substantially bypasses the turbine wheel (13).

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10. The engine boosting system according to claim 11, comprising a turbocharger (8) having a turbine (1) comprising the variable nozzle device according to any one of claims 1 to 4.

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